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(54) **Fuel treatment device**

(57) A fuel treatment device for an internal combustion engine includes a casing 17 which contains a treatment medium such as a filter element 18. Water collects in a space 22 in the casing and is drawn from the space through a tube 24 connected to the throat 23 of a venturi, by the flow of air through the venturi. The air flow is produced by connecting the venturi across the air filter 16 in the air intake line of the engine. As shown, a float-operated switch controls valve 27 to actuate the venturi when water accumulates. In Fig. 2 (not shown) the venturi is permanently connected to the air line, but a float-operated valve opens and closes the lower end of tube 24.

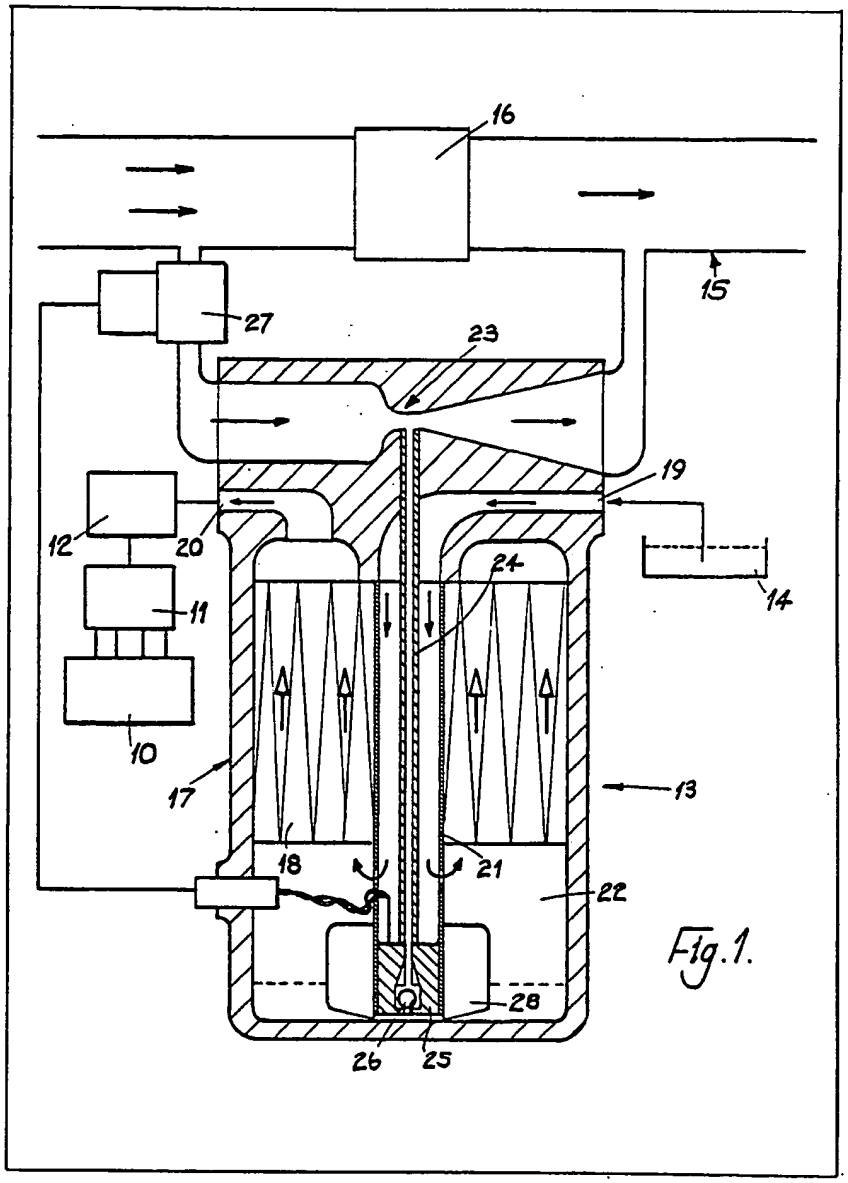

Fig. 1.

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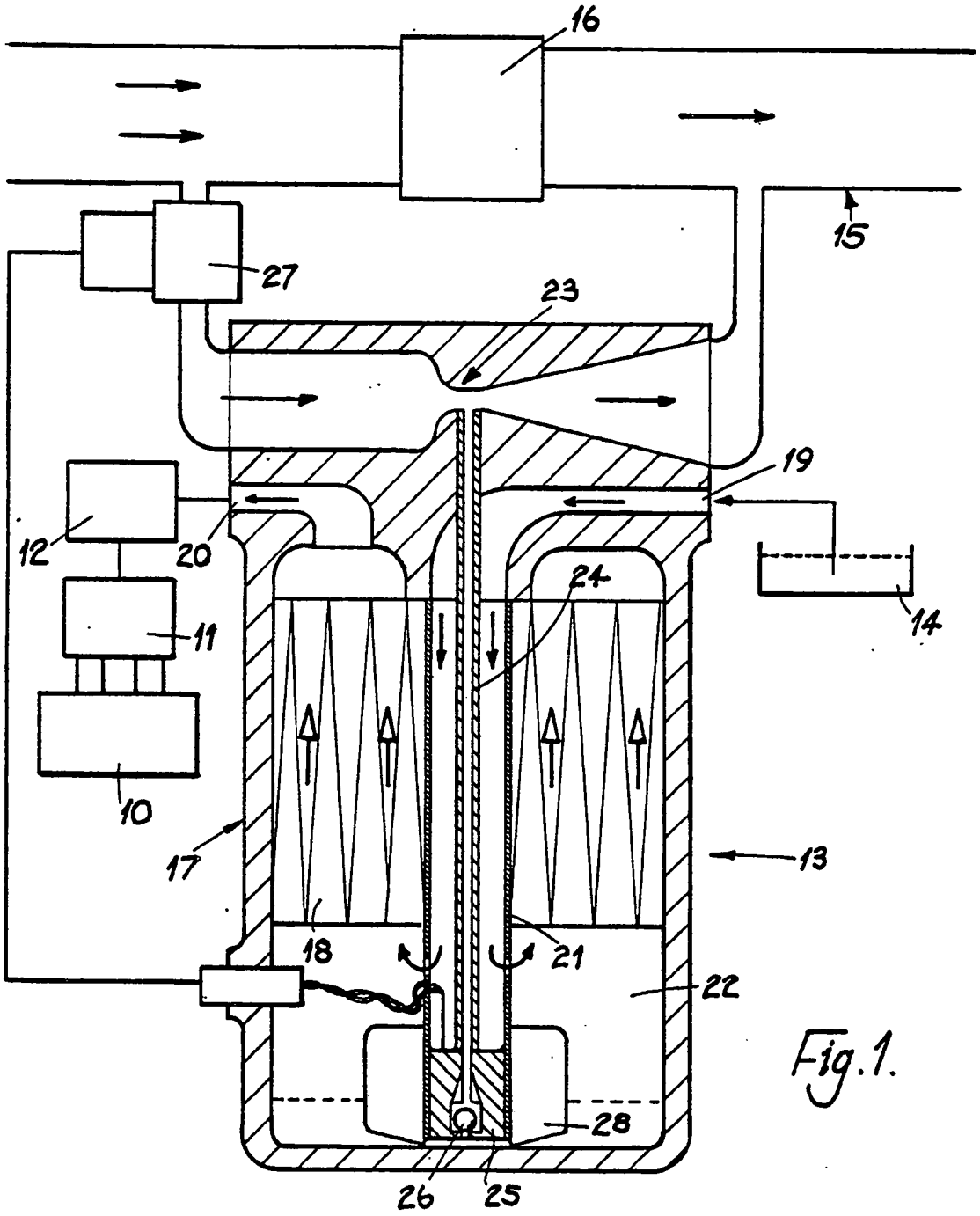

Fig.1.

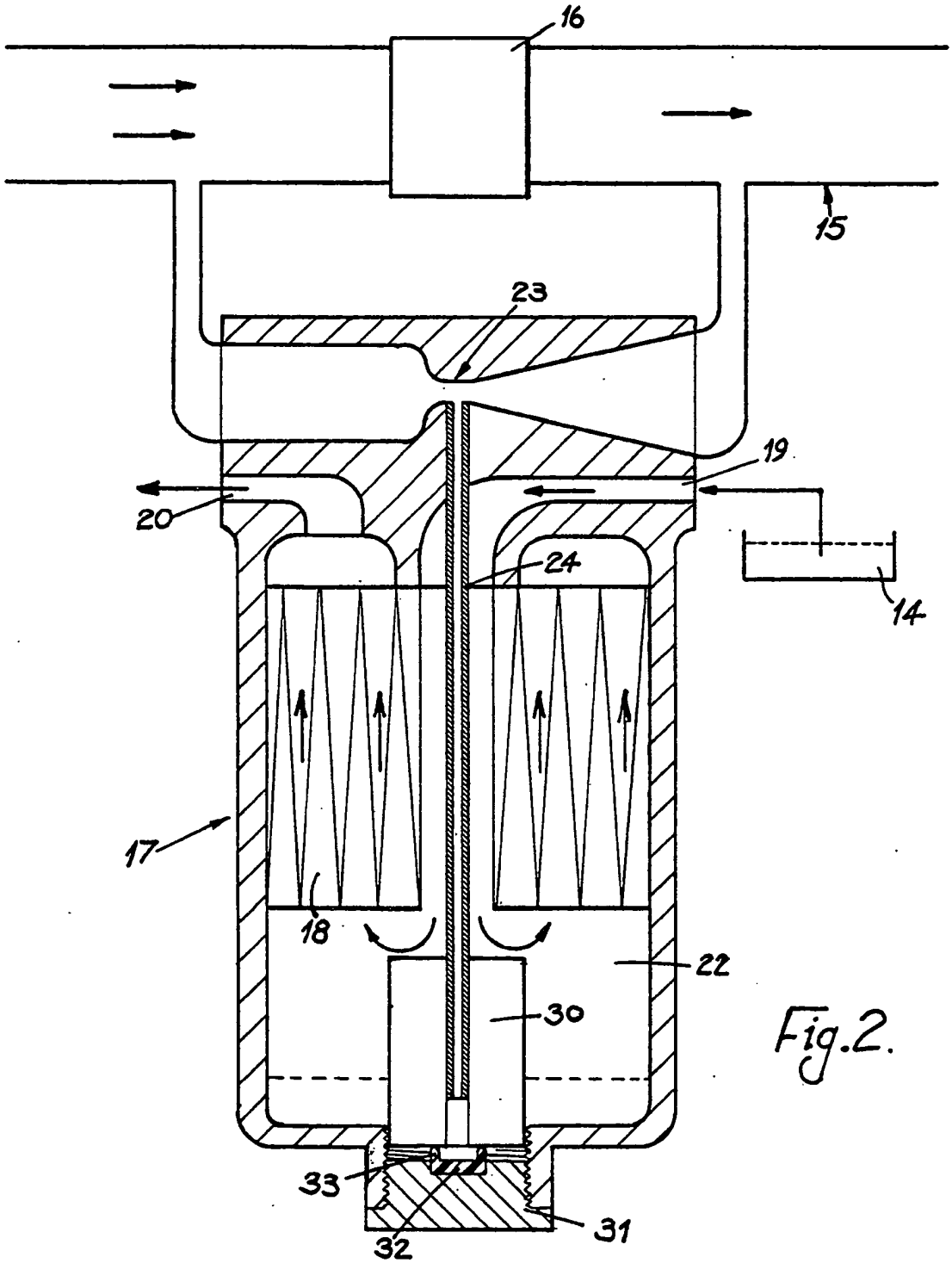

Fig.2.

SPECIFICATION
Fuel treatment device

This invention relates to a fuel treatment device for use in the fuel system of an internal combustion engine, the device being of the kind comprising a casing having a fuel inlet and a fuel outlet, a fuel treatment element located in the casing which acts to separate contaminant from the fuel flowing between the fuel inlet and the fuel outlet, said casing defining a space in which, in use, water contained in the fuel can collect.

It is important to ensure that the water collecting in the aforesaid space shall be drained from the space before it has a chance to flow through the outlet. The amount of water contained in commercially available fuel varies and hence it is not possible to specify a time in terms of engine miles or fuel consumed, after which the water must be drained. It is known to provide the casing with a transparent portion whereby the water level can be ascertained by inspection. It is also known to provide a warning system whereby the operator of the engine will be warned when the water reaches a predetermined level. These known systems require that the operator shall perform the act of draining the water when the warning is given and in the first case of inspecting the device at regular intervals.

The object of the present invention is to provide a device of the kind specified in which the water can be drained from the aforesaid casing.

According to the invention a fuel treatment device of the kind specified comprises a venturi through which in use, air can flow, and an intake pipe connected to the throat of said venturi and extending into said space, whereby the flow of air through said venturi will cause water contained in said space to be drawn through said intake pipe from said space.

In the accompanying drawings:—

Figure 1 is a sectional side elevation of one example of the device together with portions of an engine and its fuel system; and

Figure 2 is a view similar to Figure 1 showing another form of the device.

Referring to Figure 1 of the drawings, a compression ignition engine is indicated at 10, the engine having a high pressure fuel pump 11 associated therewith, the pump delivering fuel in timed relationship to the injection nozzles of the engine. Fuel at low pressure is delivered to the high pressure pump 11 by means of a low pressure pump 12. The pumps 11 and 12 may be housed in the same body.

The inlet of the pump 12 is connected by way of a fuel treatment device generally indicated at 13, with a fuel supply tank 14. The engine has an air inlet manifold, a portion of which is indicated at 15 and the manifold is connected to an air filter generally indicated at 16.

The fuel treatment device 13 in the particular example, is a filter and it comprises a casing 17 of hollow form in which is located an annular paper filter element 18. The upper portion of the casing defines a fuel inlet 19 which is connected to the supply tank and a fuel outlet 20 which is connected to the inlet of the pump 12. As will be seen, the inlet 19 is connected to the upper portion of a tubular element 21 located within the casing and about which the filter element 18 is located.

Defined in the casing below the filter element 18, is a space 22 with which the lower end of the element communicates. The arrangement is such that the pump 12 draws fuel through the filter element 18, the fuel passing down through the tubular element 21 to the space 20 and from the upper portion of the space 22 by way of the filter element 18, to the fuel outlet 20. As the flow of fuel takes place, water contained in the fuel tends to collect in the space 22 so that the space 22 will gradually become filled with water. Solid contaminants are retained by the filter element.

Formed in the upper portion of the casing is pump means in the form of a venturi having a throat 23. There is connected to the throat an intake pipe 24 which extends downwardly through the tubular element 21 to adjacent the bottom of the space 22. At the lower end of the intake there is formed a valve housing 25 which accommodates a ball valve 26. The upstream portion of the venturi is connected by way of a valve 27, to the inlet manifold 15 upstream of the air filter 16 and the downstream portion of the venturi is connected to the manifold downstream of the filter 16. The valve 27 is electromagnetically controlled and when the valve is opened, air flow will take place through the throat of the venturi. Moreover, the outlet portion of the venturi is shaped so as to cause a gradual reduction in the velocity of the air.

The reduction in pressure which occurs at the throat of the venturi is sufficient to draw the water contained in the space 22 out of the casing. This water becomes entrained with the air flowing to the engine and the dimensions of the venturi are such that the flow of water into the engine does not exceed approximately 1% of the maximum fuel flow to the engine. It should be noted that the reduction in pressure caused by the venturi must be sufficient to overcome the reduced pressure which will exist, in use, in the casing by virtue of the action of the pump 12. The valve 26 acts when the valve 27 is closed, to prevent air being drawn into the casing from the air inlet manifold.

The valve 27 is conveniently controlled by a float operated switch, the float of which is seen at 28. The float has a density such that it will sink in fuel but float on the interface between the fuel and water. Conveniently the float carries a magnet and the switch is a reed switch.

Referring now to Figure 2, parts which have the same function as those of the system of Figure 1 are assigned the same reference numerals. In the example of Figure 2 the opposite ends of the venturi are permanently connected to the inlet manifold at points on the opposite sides of the air filter 16 respectively, so that when the engine is in operation there will be a flow of air through the

throat 23 of the venturi. The intake pipe 24 is connected as before, to the throat of the venturi and it extends to the lower portion of the space 22. In the space 22 is located a float 30 which is slidable about the lower portion of the pipe 24.

In the lower wall of the casing 17 there is located a plug 31 which carries an elastomeric member 32 which defines an annular sealing lip 33 larger in diameter than the bore in the float. The float 30 when in its lowermost position as indicated, is in sealing engagement with the lip and it is arranged to "float" from the lip only when the water level in the space exceeds a predetermined height. When the float does lift from the lip, water is drawn from the space through the pipe 24 and the float will reseat on the lip.

CLAIMS

1. A fuel treatment device for use in the fuel system of an internal combustion engine, the device being of the kind comprising a casing having a fuel inlet and a fuel outlet, a fuel treatment element located in the casing which acts to separate contaminant from the fuel flowing between the fuel inlet and the fuel outlet, said casing defining a space in which, in use, water contained in the fuel can collect, a venturi through which in use, air can flow and an intake pipe connected to the throat of said venturi and extending into said space whereby the flow of air through said venturi will cause water contained in said space to be drawn through said intake pipe from said space.

2. A device according to Claim 1 including means responsive to the level of water in said space, said means acting to control flow through said intake pipe.

3. A device according to Claim 2 in which said means comprises a float controlled switch, the device including a valve controlled by said switch said valve when closed, preventing air flow through said venturi.

4. A device according to Claim 3 including valve means in said intake pipe, said valve means closing to prevent air flow through said intake pipe into said space.

5. A device according to Claim 2 in which said means comprises a float controlled valve associated with said intake pipe.

6. A device according to Claim 5 in which said float is slidably located about said intake pipe the valve including an elastomeric member located in the casing and defining a sealing lip engageable with the base of the float to prevent flow through said intake pipe.

7. A device according to any one of the preceding claims in which air flow through said venturi is effected in use, by connecting the upstream and downstream ends of the venturi to the air inlet manifold of the associated engine on opposite sides respectively of an air filter therein.

8. A fuel treatment device for use in the fuel system of an internal combustion engine comprising the combination and arrangement of parts substantially as hereinbefore described with reference to Figure 1 of the accompanying drawings.

9. A fuel treatment device for use in the fuel system of an internal combustion engine comprising the combination and arrangement of parts substantially as hereinbefore described with reference to Figure 2 of the accompanying drawings.

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